

Appl. No. 09/584,363
Amendment Dated March 5, 2004
Reply to Office Action of December 5, 2003

Our File: 38898-0089 TLS

REMARKS

In the response claims 1, 2, 8, 23 to 26, and 28 have been cancelled. Claim 3 has been rewritten in independent form incorporating all of the limitations of the base claim and intervening claims and the limitation that the adaptable path transits the switch fabric such that an optical switching element of the input matrix redirects the wavelength (that is being switched) away from the plane of the input matrix to an optical switching element of the output matrix. Support for this limitation may be found in the specification at page 10, lines 5 to 12, and original claim 21. Claims 12 and 13 previously depending from cancelled claim 2 have been amended to depend from amended claim 3. Likewise, claims 14 and 17 previously depending from cancelled claim 1 have been amended to depend from amended claim 3. Claim 18, previously depending from cancelled claim 1 has been amended to depend from amended claim 17. Claim 14 has been amended to delete and coordinate with those elements now present in amended claim 3 which is its new base claim (because of the cancellation of claim 1) and to recite the presence of at least one add zone to correct an antecedent problem. Likewise, claim 16 has been amended to delete those elements now present in amended claim 3 (which is its new base claim because of the cancellation of claim 1) and to recite the presence of at least one add port to correct an antecedent problem. Similarly, claim 19 has been amended to delete those elements now present in amended claim 3 which is now its new base claim because of the cancellation of claim 1. Independent claim 20 has been amended to include the limitation that the adaptable path transits the switch fabric such that an optical switching element of the input matrix redirects the wavelength (that is being switched) away from the plane of the input matrix to an optical switching element of the output matrix. Independent claim 22 has been amended to better describe the invention by incorporating the limitations of previously dependent claims 23, 24, 25, and 26, and the limitation that the adaptable path transits the switch fabric such that an optical switching element of the input matrix redirects

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the wavelength (that is being switched) away from the plane of the input matrix to an optical switching element of the output matrix. Claim 27 has been amended to delete those elements now present in amended claim 22, and to recite the presence of an add port to correct an antecedent problem. Likewise, claim 29 has been amended to delete those elements now present in amended claim 22, and to recite the presence of an drop port to correct an antecedent problem. The remaining claims have not been changed. No new matter has been added.

The Examiner has rejected claims 1, 13, 14-19, and 27 under 35 U.S.C. 112 as being indefinite. In particular the Examiner has objected that there is insufficient antecedent basis for the term "said wavelength" in claim 1, "said add zone" in claims 14, 16, and 27; "drop wavelength" and "said drop zone" in claim 17, and "K" in claim 13. Applicant has cancelled claim 1. Amended claims 14, 16, and 27 now have a proper basis for reciting "said add zone". Amended claim 17 now recites "a drop wavelength" and has a proper basis for reciting "said drop zone". Amended claim 13, now dependent from amended claim 3, now has a proper antecedent basis for reciting the term "K" as this term is initially recited in amended claim 3. Applicant submits that amended claims 13, 14-19, and 27 are now compliant with the requirements of 35 U.S.C. 112.

The Examiner has rejected claim 1 under 35 U.S.C. 103(a) as being unpatentable over Karasan et al. (U.S. Patent No. 5,878,177). Applicant has cancelled claim 1.

The Examiner has rejected claims 2-12, 20-26, and 28-32 under 35 U.S.C. 103(a) as being unpatentable over Karasan et al. in view of Gloeckner et al. (U.S. Patent No. 6,445,841).

Karasan et al. disclose a layered switch architecture having at least two switching layers wherein the input ports and output ports of each switching layer are fully interconnected, but the general separation of the switching layers i.e. lack of interconnection, is viewed as

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desirable for reducing switch size ("*...the present invention considers the layering as a desirable feature in itself...*" Column 2, lines 26-27). A review of the figures, especially Figures 8 to 12, and the associated discussion of these figures in the description focuses on the improvements and the advantages associated with the use of lightly interconnected layers over a non-layered approach. Thus the teachings of Karasan et al. may be fairly said to be directed to the advantages inherent to less coupling between switching layers.

Gloeckner et al. disclose various configurations of optomechanical matrix switches for switching optical signals from input fibers to output fibers. In particular, Gloeckner et al. discloses matrix switches with collimator arrays and tiled architecture wherein a plurality of MEMs crossbar optical switches are interfaced to one another via collimator arrays. The collimator arrays focus the optical outputs of one switching matrix onto the inputs of an adjacent switching matrix. For example, in regards to embodiments depicted in Figures 17 and 18 and described at Column 14: "*In operation, the optical crossbar 1700 is designed to provide an array of free-space optical connections between collimated input and output fibres.*" (lines 10-14) and "*As is indicated by FIG. 18, a set of four MEMS matrix switches 1732-1735 are arranged in a "tiled" configuration and interconnected through a number of collimator arrays 1740-1749.*" (lines 38-41).

A review of both Karasan et al. and Gloeckner et al. shows that in their descriptions where there are at least two switching matrices (or layers) they do not disclose nor suggest the routing of optical signals from one switching matrix (or layer) to another switching matrix or layer without traversing the edges of the switching matrices. That is, all optical signals follow paths in and out of the edges and along the plane of the switching matrices.

By way of contrast Applicant's amended claim 3 recites that "...said adaptable path transits said switch fabric such that an input optical switching element of said input matrix redirects said wavelength away from the plane of said input matrix to an output optical switching

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element of said output matrix." This limitation may be seen illustrated in the embodiment of the invention depicted in Figure 3B wherein there is a spatial view showing a switching operation. As described on page 10 of the specification at lines 5 to 12 in which in the example embodiment array 10 is an example of an input matrix and matrix 20 is an example of an output matrix: "In turn, the mirrors of array 10 direct the respective incident wavelength on a target mirror of MEMS matrix 20. ... As the mirrors can rotate about two axes, each mirror can redirect wavelength λ_1 on any mirror of matrix 20 according to the position of mirror in matrix 10..." It can be seen that Applicant's invention as claimed comprises (among other elements) a pair of switching matrices, an input matrix and an output matrix, and that all switched optical signals move from an optical switching element of the input matrix, away from the plane of the input matrix, and onto the output matrix.

As discussed previously, Karasan et al. teaches towards less connectivity between layers. If the "layers" of Karasan et al. were considered to correspond to the input and output matrices of Applicant's present invention, it can be fairly said that Karasan et al. teaches away from Applicant's claimed invention because of the emphasis on reduced connectivity between layers. Applicant's claimed invention provides for complete and direct coupling between any element of the input matrix and a desired element of the output matrix.

With respect to the teachings Gloeckner et al. a fair reading turns up no suggestion of direct interconnection of independent elements where multiple matrices are present. Instead interconnection is via intermediary edge elements such as collimator arrays. In contrast, Applicant's claimed invention provides for interconnection of switching elements between the input and output matrices via an optical path which exits the plane of the switching matrix.

As neither Karasan et al. nor Gloeckner et al. disclose or suggest, singly or in combination

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this aspect of the present invention, Applicant submits that that the subject matter of the Applicant's claims would not have been obvious to a person skilled in the art or science to which it pertains, and the objection is respectfully traversed.

Likewise, amended independent claims 20 and 22, both reciting due to amendment the limitation that "...said adaptable path transits said switch fabric such that an input optical switching element of said input matrix redirects said wavelength away from the plane of said input matrix to an output optical switching element of said output matrix." also would not have been obvious to a person skilled in the art or science to which it pertains, and the rejection is respectfully traversed with respect to these claims.

With respect to the Examiner's rejection of claims 3-19, and 30-32, Applicant notes that claims 2 and 8 have been cancelled. Claims 4-7, 9-19, and 30-32 all have claim 3 for their base claim. Applicant submits that, as these claims are dependent from claim 3, then they are allowable for at least the same reasons and arguments recited above.

Likewise, with respect to the Examiner's rejection of claim 21, Applicant submits that, as this claim is dependent from claim 20, then it is allowable for at least the same reasons and arguments recited above.


With respect to the Examiner's rejection of claims 23-29, Applicant notes that claims 23-26, and 28 have been cancelled. Claims 27 and 29 depend from claim 22, and Applicant submits that they are allowable for at least the same reasons and arguments recited above.

In view of the foregoing amendments and arguments, Applicant submits that the claims are in condition for allowance. Favourable reconsideration and approval of this application is respectfully requested.

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Respectfully Submitted,

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